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ENVIRONMENTAL CONDITION ALARM WITH VOICE ENUNCIATION

Field of the Invention:

The invention pertains to ambient condition detectors with voice output. More particularly, the invention pertains to such detectors wherein synthesized voice can be used to provide parametric or status information for a respective detector.

Background of the Invention:

Ambient condition detectors have become wide-spread and are used in residences for sensing the presence of potentially dangerous ambient conditions such as gas or fire. Many known detectors provide a tonal or pulsed alarm output in the presence of a predefined, potentially dangerous, ambient condition. Some detectors provide additional information as to condition and location of the condition using synthesized speech. One such detector has been disclosed and claimed in Morris US Patent 6,144,310 entitled "Environmental Condition Detector With Audible Alarm and Voice Identifier".

Gas detectors are known which include numeric displays for the purpose of providing visual information pertaining to gas concentration. For example, a level of gas, in parts per million and/or mode of operation of the detector can be visually presented using such displays.

One recognized deficiency of known detectors with visual displays arises from the location of the respective detector when in use. AC powered gas detectors are often plugged into AC receptacles, which are installed near the floor. On the other hand, smoke detectors are usually installed on a ceiling to take advantage of the propensity of airborne particulate matter such as smoke to rise. Neither of these locations is particularly conducive to directly viewing a detector mounted display.

Known alternates such as incorporating larger displays or backlighting the displays to make the alphanumerics being presented easier to read, apart from being just a partial solution to the problem, increase the price of the respective detector. They may also increase energy requirements which impose additional drains and shorten battery life in battery powered detectors.

There continues to be a need for ambient condition detectors which can in a user friendly way, provide additional information as to condition being sensed and detector status than has heretofore been possible. Preferably, such functionality would provide as much as or more information than known detectors having a visual display without exhibiting the drawbacks of a visual display given the typical locations where such detectors are usually installed. Preferably, additional parametric or status information would be provideable to a user without a commensurate increase in detector cost.

Summary of the Invention:

An ambient condition detector incorporates a housing which carries an ambient condition sensor, control circuitry coupled to the sensor, and voice output circuitry coupled to the control circuitry. The voice output circuitry can provide dynamic on-going feedback to a user in the vicinity of the respective detector as to, for example and without limitation, real time parts per million of detected gas, peak parts per million values, mode of operation of the detector, temperature, humidity, level of detected smoke, status of sensors, other components, power supply and time of day. Power can be supplied to the respective detector via self contained batteries or by utility supplied AC.

One embodiment of a detector in accordance with the invention incorporates a radiant energy input port, such as infrared, whereat command signals generated by a remote source can be received. The command signals can direct the respective detector to audibly output one or more selected parameters, status indicators or the like, as required by the user and in the absence of an alarm condition.

Using the radiant energy input port, the end user or consumer can easily program the location of the detector enabling it to provide audible feedback as to the location of a selected ambient condition. Other feedback information, audibly available, in response to received infrared signals includes battery status, status of the sensor or sensors and any other desired internal detector parameters.

In one embodiment, the housing can carry two or more sensors. One sensor can be directed to selected gas. Another sensor can be directed to ambient smoke. A third sensor, if desired, can be directed to sensing temperature or ambient humidity.

In response to sensing a predetermined condition such as gas or smoke, the respective detector can, upon entering an alarm state, emit one or more different audible alarms, associated with a respective sensed ambient condition. Audio information as to type of condition and location of the condition can be interleaved in silent intervals either between audible alarm indicators such as tones or between groups of tones.

The detectors can be interconnected without any need for an alarm control unit. In this embodiment, a consumer using a remote unit can request voice feedback as to status or other information pertaining to displaced interconnected detectors.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings.

Brief Description of the Drawings:

Fig. 1 is a block diagram of a detector in accordance with the present invention; and

Fig. 2 is a diagram of a system which incorporates a plurality of detectors such as the detector of Fig. 1.

Detailed Description of the Preferred Embodiments:

While this invention is susceptible of embodiment in many different forms, there are shown in the drawing and will be described herein in detail specific embodiments thereof with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

Figure 1 illustrates a detector 10 in accordance with the present invention. The detector 10 is self-contained in a housing 12 which is mountable on a surface, such as a ceiling, or, an AC receptacle in the event that the detector 10 carries AC prongs.

The detector 10 includes one or more sensors 14a ... 14n. The sensors 14 respond to a variety of ambient conditions including airborne gas, temperature, humidity, as well as smoke indicative of fire. Outputs from the sensors 14 are coupled to control circuitry 16 which can incorporate a programmed processor 16a.

Processor 16a can include inboard or outboard programmable read-only memory or read-only memory indicated generally at 16b for storage of executable instructions, a control program. Those of skill in the art will understand that control circuitry 16 would include, as desired, interface circuitry for coupling to sensors 14.

Detector 10 can also include a radiant energy sensor such as an infrared receiver 18. Receiver 18 is responsive to a remote control unit 18a, for example of a type which generates infrared signals. Use of the displaced or remote radiant energy source 18a is discussed in more detail subsequently.

Control circuitry 16 can also incorporate sensing circuitry for sensing characteristics of input power at input port 16c which can be derived from utility supplied AC and/or a battery carried in housing 12. A low battery signal, or loss of utility supplied AC can also be sensed by control circuitry 16.

Control circuitry 16 is also coupled to voice synthesizing circuitry 22 which is in turn coupled to an output transducer, such as a speaker 24. Voice

synthesizing circuitry 22, responsive to control signals received from control circuitry 16 can emit, as audible output, human discernable speech. The audible outputs can include parametric information pertaining to sensor condition, ambient condition(s) being sensed, type of ambient condition being sensed, status information pertaining to available power or alarm state. Other audible outputs include location information, all without limitation.

Detector 10 is particularly user friendly in that while mountable on a ceiling for detection of heat or ambient smoke or mountable on an AC receptacle near floor level for detection of gas, the user or consumer can readily obtain information from the detector 10 via voice output circuitry 22. The available voice feedback obviates any need for large and expensive visual displays.

The user or consumer requests the desired parametric or status information using remote control 18a. Detector 10 responds to incident radiation R. Control circuitry 16 determines the received command and can, in response thereto, verbally provide gas levels in parts per million, ambient smoke density, diagnostic information such as condition or status of input power, AC or battery, or status or condition of the various sensors or components in the detector 10. Additionally, the consumer via the remote 18a can program the detector 10 with the location during installation. The consumer can also program the detector 10 to announce one or more prestored alarm conditions consistent with the sensors 14 available in the unit.

The detector 10, in response to remote control 18a can provide the parametric and/or status verbal feedback to the consumer or user when the unit is not in an alarm condition. Both location flexibility and consumer friendliness are enhanced by the availability of voice feedback, as described above, on demand.

Fig. 2 illustrates an interconnected detector system 28 which incorporates a plurality of substantially identical detectors 30. The members of the plurality 30 are substantially identical to the detector 10. In the system 28, the

detectors are each interconnected via port 16c. They can be powered off of self-contained batteries or utility supplied AC power via interconnect cable 32.

A user, via wireless remote control unit 18a is not only, in the system 30, able to receive verbal feedback from a detector 30l in the vicinity of the user and in the vicinity of the remote 18a. Additionally, the user via the commands sent from the remote 18a can receive verbal feedback from detector 30l which pertains to other interconnected detectors such as the detector 30p or the detector 30u which might be in other displaced portions of a residence or building wherein the detectors are located. Hence, the user, via detector 30l could determine that detector 30p needs replacement batteries or, is exhibiting a malfunction of a predetermined type without having to go to the respective detector and either visually examine a display thereon, such as a light emitting diode or an alphanumeric display or listen for audible feedback at the respective detector. Thus, a user's ability to obtain verbal feedback from the components of the system 28 is substantially enhanced using the remote control unit 18a.

It will be understood that while the remote control unit 18a can be an infrared based command device, that other forms of wireless communication such as visible light, RF or ultrasonics could be used without departing from the spirit and scope of the present invention.

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the invention. It is to be understood that no limitation with respect to the specific apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within the scope of the claims.